REMARKS

Reconsideration is respectfully requested in view of the foregoing amendments and the remarks which follow.

Claim 6 has been amended to recite that the percentage by weight of TiO_2 is between 0.2 to 1. Claim 9 has been amended to correct certain minor errors. The amendment are fully supported in the specification.

It is respectfully submitted that claims 6-9 serve to overcome the rejection of the cited claims under 35 USC § 103 (a) based on Koyama et al, U.S. Patent Application Publication 2003/0114291 A1 and the § 103(a) rejection based on Landa et al., U.S. 7,169,722. These rejections are traversed.

The Koyama patent application US 2003/0114291 discloses in various paragraphs the following:

[0021] A high transmittance glass sheet.

[0023] A solar radiation transmittance of 87.5% or higher, a visible light transmittance of 90.0% or higher.

[0022] The composition containing silica as a main component and as coloring components, expressed in wt. %, not less than 0.005% to less than 0.02% of total iron oxide in terms of Fe_2O_3 (hereinafter referred to as T-Fe_2O_3), less than 0.008% of FeO, and not more than 0.25% of cerium oxide, and having a ratio of FeO in terms of Fe_2O_3 T-Fe_2O_3 (hereinafter referred to as a FeO ratio) of lower than 40%.

[0031] A composition containing not more than 0.005% of cerium oxide and having a FeO ratio of 22% or higher, and which exhibits an excitation purity of 0.25% or lower. This allows the formation of a glass sheet havaing high light transmission that results in a glass sheet having a higher degree of colorlessness. Preferably, this high transmittance glass sheet is substantially free from cerium oxide.

[0032] Another embodiment of Koyama's glass sheet has, in addition to the above-mentioned optical properties, a composition containing 0.02 to 0.25% of cerium oxide and having a FeO ratio of lower than 22%,

[0033] When cerium oxide or the like, which acts as an oxidizing agent is added, the transmittance in a region ranging from a longer wavelength side of the visible region to the infrared region is improved, and a high solar radiation transmittance and a high visible light transmittance can be attained. However, it has been demonstrated that when a glass sheet having a T-Fe_2O_3 content as low as that described above, to which an oxidizing agent is added, is subjected to ultraviolet irradiation, the transmittance in a region ranging from a longer wavelength side of the visible region to the infrared region is lowered.

[0034] When a glass sheet to which cerium oxide has not been added is subjected to ultraviolet irradiation, the transmittance in a region ranging from a longer wavelength side of the visible region to the near-infrared region is increased.

[0035] As confirmed by the Applicants of the claimed invention, for the observation of the phenomenon in [0033] and [0034] preferably, cerium oxide, manganese oxide and vanadium oxide, which act as oxidizing agents, are not present in any substantial quantity. The content of the cerium oxide is limited to not more than 0.005%. Similarly, the content of manganese oxide is preferably not more than 0.03%, and the content of vanadium oxide is preferably not more than 0.01%.

[0036-0037] When a glass sheet having limited contents of components acting as oxidizing agents and a Fe_2O_3 content reduced to not more than 0.02% is subjected to ultraviolet irradiation at a wavelength of not more than 400 nm, the transmittance at a wavelength of 1,000 nm can be improved by not less than 0.1% and in some cases, by not less than 0.3%. See examples (Examples 19 to 30) wherein in this case, the FeO is decreased to lower than 22%.

[0038-0039] When the glass sheet is subjected to ultraviolet irradiation at a wavelength of not more than 400 nm, the maximum levels of oxidant agents is maintained.

[0048-0050] In these paragraphs there is described the base glass composition of the glass silica-sodium-calcium and the inventors' (Koyama's) comments that the composition is substantially free from coloring components other than iron oxide, cerium oxide and manganese oxide.

With respect to paragraphs [0031]-[0039], [0048]-[0050] which were cited by the Examiner, Applicants provide the following comments:

Both the reference patent and the claimed invention coincide in their properties and lack of color. The differences are that Koyama obtains his properties by adding oxidizing agents, such as cerium oxide, manganese and vanadium. By contrast, Applicants herein achieve the claimed invention by adding titanium dioxide in the form of **rutilic (TiO_2).**

In paragraph [0054] Koyama describes a colorless glass which is based on TiO_2 of 0.05% to 1.0%, 0.01-0.03% Fe_2O_3 and a reduction (%Fe^{2+}) from 20 to 30%.

In the claimed invention it is evident that by increasing the concentration of titanium oxide in the glass, an increase in the visible light transmission is achieved.

Those possessing skill in the art of preparing glass formulations would offer the explanation that some raw materials such as sand, contain titanium dioxide impurities, which can be seen in the examples of Koyama (Examples 1 to 18 - Tables 1, 2 and 3), where between 0.02% to 0.04% of TiO_2 is contained. In Examples 19-30, this is held constant at 0.02%. ***This means that in Koyama there is no intentional addition of TiO_2 in the formula.***

By contrast, in the claimed invention, the TiO_2 is intentionally added at a level from between 0.2% to 1.0% in the glass composition in order **to modify the light transmission properties.**

As is well-known in the art, the presence of cerium oxide has been demonstrated to affect and modify the redox state of the glass. Glasses which have CeO_2 added thereto, show a low level of ferrous oxide (FeO).

Finally, the Koyama patent application is only commenting on the ***probability*** of using TiO_2, at page 5, paragraph [0063] of the application.

> *[0063] Although not an indispensable component, TiO_2 can be added in a proper amount for the purpose of enhancing an ultraviolet-absorbing ability or the like as long as the amount is in the range that allows the optical properties that are the intended properties of the present invention not to be impaired. When an excessive amount of TiO_2 is contained, the glass becomes more likely to become yellowish, and the transmittance at a wavelength in the vicinity of 500 to 600 nm is lowered. Thus, preferably, the content of TiO_2 is limited to a low level in the range of less than 0.2%.*

Thus, Koyama teaches that the content of **TiO_2 must be limited to a very low level, namely, in the range of less than 0.2%.**

In the case of the claimed invention, **the use of the TiO_2 is very critical**, which is demonstrated in Examples 4, 5 and 6. This directly impacts upon the light transmission that is being sought in this type of product. (See Table 1 below from the instant specification, particularly the circled values.)

TABLE I

Melting glass composition Fe_2O_3—TiO_2

	Sample					
	1	2	3	4	5	6
Thickness (mm)	3.11	3.19	3.15	3.18	3.22	3.08
	% by weight					
Total Iron (Expressed as Fe_2O_3)	0.0125	0.0153	0.0153	0.0237	0.0236	0.0236
TiO_2	0.005	0.005	0.262	0.005	0.262	0.605
FeO (Ferrous expressed as Ferric)	0.0029	0.0034	0.0036	0.0059	0.0054	0.0057
Fe_2O_3 (Ferric)	0.0096	0.0119	0.0117	0.0178	0.0182	0.0179
% Reduction of iron to FeO	23.5	22.0	23.6	24.8	23.1	24.1
TUV (%)	80.5	79.0	79.0	75.6	74.5	75.0
TL (%)	90.1	89.7	90.8	89.5	90.4	91.7
TE (%)	89.4	89.0	89.6	88.3	88.8	89.4
	COLOR TRANSMITTED					
L	94.9	94.7	95.3	94.6	95.1	95.7
Ah	-0.14	-0.17	-0.15	-0.23	-0.23	-0.25
Bh	0.16	0.18	0.22	0.19	0.25	0.27
X	88.3	87.8	87.6	87.6	88.6	89.8
Y	90.1	89.7	90.8	89.5	90.4	91.7
Z	106.3	105.7	102.6	105.5	106.5	107.9
Dominant wavelength	568.9	564.5	569.9	551.2	562.1	559.9
Excitation Purity (%)	0.1	0.1	0.2	0.1	0.1	0.2

Thus, since the claims clearly distinguish over the teaching of Koyama, the Examiner has failed to establish a *prima facie* case of obviousness. The rejection is deemed to have been overcome and should be withdrawn.

Regarding the Landa et al. patent (US 7,169,722), it discloses a high transmittance with a fairly clear/neutral colored glass composition comprising: SiO_2 at least 67%; Na_2O 10 to 20%, CaO 5 to 15%, MgO 0 to 8% Al_2O_3, 0 to 5%, KO_2O 0 to 5%, a colorant portion comprising: total iron (expressed as Fe_2O_3) 0.04 to 0.10% cobalt oxide, 0.1 to 15 ppm chromium oxide, 0 to 10 ppm titanium oxide, wherein the glass has a visible transmission of at least about 85%, and wherein the glass contains 0% cerium oxide.

In this case, to compensate for a yellow or yellow-green coloration, a small amount of cobalt (Co) may be provided in the glass to enable it to realize a more neutral color.

As is explained in Landa's patent, an oxidizing agent, such as cerium oxide (e.g., CeO_2) or the like **(which was not referenced as being a colorant)** is added to the glass batch in order to realize highly oxidized conditions (i.e., to significantly lower the redox of the resulting glass). **As a result of the oxidizing agent(s) used in the batch, the iron is oxidized to a very low FeO (ferrous state) content**.

The difference is even more significant (as indicated below by the circled values at columns 2 and 3 of Landa), since Landa modifies the redox using the traditional equilibrium-based balance.

$$Fe^{2+} + Ce^{4+} = Fe^{3+} + Ce^{3+}$$

Another object of certain example embodiments of this invention is to fulfill one or more of the above-listed objects.

In certain example embodiments of this invention, one or more of the above-listed objects and/or needs is/are fulfilled by providing a glass comprising: a base glass portion comprising:

SiO_2	67 to 75%
Na_2O	10 to 20%
CaO	5 to 15%
MgO	0 to 8%
Al_2O_3	0 to 5%
K_2O	0 to 5

a colorant portion comprising (or consisting essentially of):

total iron (expressed Fe_2O_3):	0.01 to 0.20%
cobalt oxide:	0.1 to 15 ppm
chromium oxide:	0 to 10 ppm
titanium oxide:	0 to 0.5%

-continued

glass redox:	<=0.10
% FeO:	0.0001 to 0.05%

and wherein the glass has a visible transmission of at least about 85%.

In certain other example embodiments of this invention, one or more of the above-listed objects is/are fulfilled by providing a glass comprising:

total iron (expressed Fe_2O_3):	0.01 to 0.15%
cobalt oxide:	0.1 to 15 ppm
chromium oxide:	0 to 10 ppm
titanium oxide:	0 to 0.5%
glass redox:	<=0.10
% FeO:	0.0001 to 0.05%

wherein the glass has a visible transmission of at least about 85%.

In certain other example embodiments of this invention, one or more of the above-listed objects is/are fulfilled by providing a glass comprising:

total iron (expressed Fe_2O_3):	0.01 to 0.15%
glass redox:	<=0.12
% FeO:	0.0001 to 0.05%

wherein the glass has a visible transmission of at least about 85%.

Landa also teaches a glass with high light transmission and solar transmission. The difference, however, is how one goes about achieving these objectives.

Regarding the concentration of colorants disclosed by Landa, Applicants submit that the iron oxide (Fe_2O_3), chromium oxide (Cr_2O_3) and titanium oxide can be present in low concentrations as undesirable contaminants in some of the raw materials, mainly in the silica sand. As mentioned by Landa, the removal of iron from the raw glass-making materials implies that the materials are more pure. Landa, however, discloses that he prefers higher levels of iron oxide, most preferably from 0.04 to 0.10%, while in the claimed invention, the iron oxide is only from about 0.01 to 0.03 wt% Fe_2O_3.

Themost significant distinction between the claimed invention and what is taught by Landa is the Redox level. In Landa, the Redox level must be less than 0.12, and

preferably <0.05, while in the claimed invention, the range is from 0.20 to 0.30 (20 to 30% Ferrous).

In order to achieve a high visible transmission and/or fairly neutral color given such a high total iron content, in certain exemplary embodiments of Landa's invention an oxidizing agent(s), such as cerium oxide (e.g., CeO_2) or the like, is added to the glass batch in order to realize highly oxidized conditions (i.e., to significantly lower the redox of the resulting glass). **As a result of the oxidizing agent(s) used in the batch, the iron is oxidized to a very low FeO (ferrous state) content**. This is advantageous since ferrous iron (Fe^{2+}; FeO) is a much stronger colorant than is ferric iron (Fe^{3+}). In certain exemplary embodiments of the Landa invention, the resulting glass **has a glass redox value of no greater than 0.12** (more preferably <=0.10; even more preferably <=0.08; and most preferably <=0.05) and an % FeO (i.e., ferrous content) of from 0.0001 to 0.05%, more preferably from 0.0001 to 0.01% and most preferably from 0.001 to 0.008%.

In the claimed invention, with about 20-30% reduction in the **Redox** (Fe^{2+}) value and from about 0.2 to 1 wt % of TiO_2, the Applicants achieve a glass composition having a visible light transmission of at least 87%, a ultraviolet radiation transmittance of no more than 81%; a solar direct transmittance no more than 90%; a dominant wavelength from 600 to 490 nm, and a purity of less than 2%.

When Landa's patent describes the combination of Fe_2O_3-CeO_2, it implies a low glass redox value and that the glass may still realize a yellow or yellow-green coloration. In order to compensate for such coloration, a small amount of cobalt (Co) may be provided in the glass to enable it to realize a more neutral color in certain exemplary embodiments of Landa's invention. Thus, the use of the oxidizing agent(s) decolorizes in a chemical fashion, and the simultaneous use of Co in certain embodiments decolorizes in

a physical fashion. **However, one of ordinary skill in the art knows that the presence of "Cobalt" affects the visible transmission in glass where a high transmission is required.**

In the case of the claimed invention and based on reports in the literature on the effect conferred by TiO_2 in refraction index, M.D. Beals, "Effects of Titanium Dioxide in Glass", in *The Glass Industry*, September 1963, pp 495-53, describes the interest that has been shown in the use of titanium dioxide as a constituent of glasses. The effects produced by the use of titanium dioxide included the comments that TiO_2 greatly increases the refractive index, increases the absorption of light in the ultraviolet region, and that is lowers the viscosity and surface tension, and that only the trivalent form could give coloration. However, this has not been observed in soda lime silica glass in the concentrations analyzed, Bamford C.R., "Color Generation and Control in Glass" *Elsevier, New York* (1977) pp 54 and, Weyl W.A. "Coloured Glasses" *The Society of Glass Technology*, Sheffield, 1959). Thus, in this manner, the claimed invention determines the concentration of TiO_2 which is necessary to increase the visible transmission, which is the main objective of the present invention.

Finally, the combination CeO_2-TiO_2, accentuates the ultraviolet absorption. Just this combination alone provides an additional difference in the values of UV. In the claimed invention it is less than 81%, while in Landa, '722, it is less than 75%.

In other words, the color and properties of each particular glass, depends on the following factors: 1) the specific components present in the glass; 2) the valence state of each of the components; 3) the amounts of the specific components; and 4) the specific amounts of the other components.

In view of the foregoing arguments, it can be seen that the claims distinguish over the teachings of Koyama et al. U.S. Published Application 2003/0114291 A1 and Landa et al. U.S. 7169722.

In conclusion, the glass composition of amended claim 6 and dependent claims 7-9 are unobvious over the prior art references employed by the Examiner, since unobvious ranges of components and properties are employed, which are neither taught nor suggested by the art. Since the claims distinguish over the art, both Koyama and Landa, withdrawal of the § 103(a) rejection is solicited since a *prima facie* case has not been established by the Examiner by a preponderance of the evidence.

The issuance of a Notice of Allowance is respectfully solicited.

Please charge any fees which may be due and have not be submitted herewith to our Deposit Account No. 01-0035.

Respectfully submitted,

ABELMAN, FRAYNE & SCHWAB
Attorneys for Applicant

By _____
Jay S. Cinamon
Attorney for Applicant
Reg. No. 24,156

666 Third Avenue
New York, NY 10017-5621
Tel.: (212) 949-9022
Fax: (212) 949-9190